REMARKS

This Amendment is filed in response to the Office Action dated March 13, 2001. All objections and rejections set forth in the Office Action are respectfully traversed.

Claims 1-31 are in the case.

Claims 1, 5, 7, 8, 9, and 12 have been amended, claim 3 has been deleted, and new claims 13-31 have been added to better claim the invention.

On page 1 of the Office Action, Claims 1-12 were rejected under 35 USC §112, second paragraph. Amendment of the claims is believed to satisfy this rejection.

With respect to all claims, the Office Action stated that it was not clear how the "radius is calculated/estimated from just three angular position measurements". We direct the examiner's attention to page 11 lines 14-15 where it is stated initial estimates of tape pack radius and error variance are also used. We also direct the examiner's attention to the equation on page 12 line 12 which shows the mathematical relation between measured tape pack radius r_m and the three angular position measurements $_c$, $_a$, and $_r$. Further we direct the examiners attention to the equation on page 13, line 18 which describes how a very accurate tape-pack radius r^+ can be calculated from previous tape-pack radius r^-, measured pack radius r_m, and Kalman filter gain.

With respect to Claim 9, the Office Action states "it is not clear where the initial estimates come from." We direct the examiners attention to the text between page 11 line 22 and page 12 line 1 that indicates that the initial estimates are chosen as "the radius when one-half of the tape is wound on the reel."

On page 1 of the Office Action, Claims 1-12 were rejected under 35 USC §103(a) citing Hermanns et al (US 4964582 issued on Oct 23, 1990) (Hermanns) and Macchia (US 4399953 issued on Aug 23, 1983).

The present invention, as set forth in representative claim 1, comprises in part as follows:

> A system for measuring tape pack radii, comprising:
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> a tape supply reel, said tape supply reel rotating as a tape leaves said tape supply reel during a tape transfer process;
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> a tape take-up reel for receiving tape from said tape supply reel, said tape take-up reel rotating to receive said tape during said tape transfer process;
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> a first angular position transducer to measure an angular position of said tape supply reel;
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> a second angular position transducer to measure an angular position of said tape take-up reel;
>
> ***a third angular position transducer to measure an angular position in response to movement of said tape;***
>
> a processor having a Kalman filter, said Kalman filter responsive to one or both of an angular position measurement by said first angular position transducer and an angular position measurement by said second angular position transducer and also responsive to an angular position measurement by said third angular position transducer, ***to calculate an updated estimate of one or both of a supply radius of a tape pack on said tape supply reel and a take-up radius of a tape pack on said tape take-up reel***;
>
> a servo-controller, responsive to one or both of said supply radius and said take-up radius, to control rotation of said tape supply reel and said tape take-up reel.

The Hermanns patent describes a system for detecting bobbin circumference including both a drive drum (supply reel) and a take-up bobbin (take-up reel). The Hermanns system (Fig. 1) ***exclusively utilizes a rotational angle sensor located on the drive drum and a rotational angle sensor located on the take-up bobbin.*** See col. 8, lines 67-68 and col. 9, lines 1-5. Furthermore, Hermanns describes an apparatus that can calculate bobbin circumference from either ***a single angular position sensor*** located on the take-up bobbin or, alternately, calculates the value by ***combining data from the sensors on both the drive drum and the take-up bobbin***. See col. 7, lines 28-34 and col. 8, lines 7-11. In this process, Hermanns uses a Kalman filter to estimate the tape-pack (bobbin) diameter indirectly by estimating initial diameter d_{0k} and tape (yarn) thickness δ_k first, and then performing additional processing steps to determine the desired result. See col. 4, lines 15-20 and col. 5, lines 1-2.

In contrast with Hermanns, the presently claimed invention includes a novel "***third angular position transducer to measure an angular position in response to movement of said tape***". The third angular position transducer may measure the angular position of a capstan, a supply reel tension arm, a take-up reel tension arm, etc. This third measurement is advantageous since it improves the accuracy of the Kalman filter calculation, in part by providing measurement of the length of tape passing the capstan. The presently claimed invention goes well beyond the disclosures of Hermanns in that the presently claimed invention utilizes measurements responsive to movement of the

tape, and thereby permits the Kalman filter to yield a more accurate estimate of the tape on the supply reel and on the take-up reel.

The Macchia patent describes a system for ensuring constant cable pay out velocity despite pay out sheave (supply reel) replacements performed as the cable is being unwound. Two storage idler rollers (idler reels) with variable separation maintain a controlled length of slack in the cable. When the supply reel is being replaced, the idler reels are drawn together, reducing the length of slack, and providing cable for payout. ***A single position sensor is utilized***, responsive, to separation of the idler reels . See col. 2, lines 50-53. The Macchia patent suggest using a Kalman filter with ***data from this single sensor*** to ***estimate the velocity at which the idler reels are drawn together***. See col. 5, lines 44-46.

In contrast with Macchia, the presently claimed invention includes a novel "***third angular position transducer to measure an angular position in response to movement of said tape***". The third angular position transducer may measure the angular position of a capstan, a supply reel tension arm, or a take-up reel tension arm. The present invention combines data from the third angular position transducer with angular position measurement of one or more reels, to estimate the result, unlike Macchia which bases its calculations upon a single sensor. The present invention's novel use of a third angular position transducer improves the accuracy of the Kalman filter calculation, in part by providing measurement of the geometry of the tape. Finally Macchia does not address tape radius, but rather addresses payout cable velocity. Thus Macchia does not teach how one might use a Kalman filter to estimate tape pack radius as the present invention does.

Applicant respectfully urges that the total absence in both the Hermanns patent and the Macchia patent of Applicants claimed novel "***a third angular***

position transducer to measure an angular position in response to movement of said tape" renders the two cited patents legally insufficient, either taken together or singly, to make the presently claimed invention obvious under 35 U.S.C. 103.

On page 2 of the Office Action, Claims 1-12 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of Abedor et al (US 6082653 issued on July 4, 2000) (Abedor). A terminal disclaimer to obviate the double patenting rejection over the issued U.S. patent is filed herewith.

All independent claims are believed to be in condition for allowance.

All dependent claims are believed to be dependent from allowable independent claims.

Favorable action is respectfully solicited.

Please charge any additional fee occasioned by this paper to our Deposit Account No. 03-1237.

Respectfully submitted,

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